

Serial No. 09/602,251
Amdt. dated September 21, 2004
Reply to Office action of July 1, 2004

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of claims:

1. (currently amended) A method of visually documenting historical changes in biological tissue, comprising the steps of:

(a) obtaining a first image of a region of tissue;
(b) obtaining pathological feature data for said region of tissue;

(c) obtaining a second image of said region of tissue using a first level of resolution;

(d) digitally storing said first and second images as digitized first and second images;

(e) spatially adjusting at least one of said first and second digitized images to spatially register said images so that corresponding features in both images are mapped to corresponding positions, said spatially adjusting comprising:

determining a coordinate transformation which produces at least a pre-determined degree of correlation between said first and second digitized images, and

applying said coordinate transformation to at least one of said first and second digitized images, to align said images;

said coordinate transformation determined by:

applying coordinate transformations of scale, position and rotation to one of said first and second digitized images, to obtain a plurality of corresponding adjusted images,

Serial No. 09/602,251
Amdt. dated September 21, 2004
Reply to Office action of July 1, 2004

cross-correlating said adjusted images with one of
said first and second digitized images, to produce a correlation
output, and

selecting a coordinate transformation which
produces at least a defined correlation output from its
corresponding adjusted image;

said cross-correlating comprising:

inputting said first and second images to an
optical correlator, and

reading said correlation output from an
output of said optical correlator;

(f) correlating said pathological feature data with said second image to define a historical region-of-interest (ROI) in said second image;

(g) rescanning the defined ROI using a second level of resolution higher than said first level of resolution to obtain a third image;

(h) spatially adjusting at least one of said historical and rescanned ROI images to spatially register said ROI images so that corresponding features in both images are mapped to corresponding positions; and

(i) creating from said historical and rescanned ROI images a composite image which visually emphasizes temporal differences between said ROI images, thereby visually emphasizing historical changes between said historical and rescanned ROI images.

2. (cancelled) The method of claim 1, wherein said step of spatially adjusting at least one of said first and second digitized images comprises:

Serial No. 09/602,251
Amdt. dated September 21, 2004
Reply to Office action of July 1, 2004

determining a coordinate transformation which produces at least a pre-determined degree of correlation between said first and second digitized images; and

applying said coordinate transformation to at least one of said first and second digitized images, to align said images.

3. (cancelled) The method of claim 2, wherein said coordinate transformation is determined by:

(a) applying coordinate transformations of scale, position and rotation to one of said first and second digitized images, to obtain a plurality of corresponding adjusted images;

(b) cross-correlating said adjusted images with one of said first and second digitized images, to produce a correlation output; and

(c) selecting a coordinate transformation which produces at least a defined correlation output from its corresponding adjusted image.

4. (cancelled) The method of claim 3, wherein said step of cross-correlating comprises:

inputting said first and second images to an optical correlator, and

reading said correlation output from an output of said optical correlator.

5. (previously presented) The method of claim 1, further comprising the step of recording said composite image for archiving.

Serial No. 09/602,251

Amdt. dated September 21, 2004

Reply to Office action of July 1, 2004

6. (original) The method of claim 5, wherein said step of recording comprises storing said composite image on a computer readable medium.

7. (original) The method of claim 5, wherein said step of recording comprises printing an image based upon said composite image.

8. (previously presented) The method of claim 1, wherein at least one of said historical and rescanned ROI images is a three-dimensional image.

9. (previously presented) The method of claim 1, wherein said step of creating a composite image comprises:

comparing an image intensity at a location in said historical ROI image with a respective intensity at a corresponding location in said rescanned ROI image, and

determining a temporal difference image value based upon the temporal difference between said image intensity at said location in said historical ROI image and the respective intensity at said corresponding location in said rescanned ROI image.

10. (previously presented) The method of claim 1, wherein said composite image visually emphasizes temporal image differences by representing various regions of said composite image in synthetic colors, based upon temporal image differences between the historical and rescanned ROI images.

11. (cancelled)

12. (cancelled)

Serial No. 09/602,251
Amdt. dated September 21, 2004
Reply to Office action of July 1, 2004

- 13. (cancelled)
- 14. (cancelled)
- 15. (cancelled)
- 16. (cancelled)
- 17. (cancelled)
- 18. (cancelled)

19. (previously presented) A system for enhancing imagery of bodily tissues by relating earlier and later images, comprising:

an image processor, programmed to:

(a) receive a first image of a region of tissue;
(b) obtain pathological feature data for said region of tissue;

(c) obtain a second image of said region of tissue using a first level of resolution;

(d) register the first and second images by controlling an optical correlator to find a position of correlation between said first and second images, said registering of said first and second images comprising:

determining a coordinate transformation which produces a pre-determined degree of correlation between said first and second images, said coordinate transformation determined by:

applying coordinate transformations of scale, position and rotation to one of said first and second images to obtain a plurality of corresponding adjusted images,

cross-correlating said adjusted images with one of said first and second images to produce a correlation output, said cross-correlating comprising inputting said first

Serial No. 09/602,251
Amdt. dated September 21, 2004
Reply to Office action of July 1, 2004

and second images to said optical correlator and reading said correlation output from an output of said optical correlator;
selecting a coordinate transformation which produces a defined correlation output from its corresponding adjusted image, and
applying said coordinate transformation to at least one of said first and second images, to align said images;

(e) correlate said pathological feature data with said second image to define a historical region-of-interest (ROI) in said second image;

(f) rescan the defined ROI using a second level of resolution higher than said first level of resolution to obtain a third image;

(g) register said historical and rescanned ROI images by controlling an optical correlator to find a position of correlation between said historical and rescanned ROI images;

(h) derive a composite image from the historical and rescanned ROI images;

(i) compute temporal differences between said historical and rescanned ROI images; and

(j) emphasize said temporal differences in said composite image; and

an optical correlator coupled to said image processor and arranged to perform said correlations.

20. (cancelled)

21. (original) The system of claim 19, further comprising a visual display, coupled to said image processor and receiving from said image processor said composite image, to permit a user

Serial No. 09/602,251
Amdt. dated September 21, 2004
Reply to Office action of July 1, 2004

to view said composite image.

22. (previously presented) The system of claim 19, further comprising an ultrasonographic imaging system, arranged to communicate ultrasonographic image data to said image processor to provide at least one of said first and second images.

23. (cancelled)

24. (cancelled)

25. (previously presented) The method of claim 1, wherein said pathological feature data corresponds to predetermined image shapes or characteristics retrieved from a pathological image library.

26. (previously presented) The method of claim 1, wherein said pathological feature data is obtained by automated analysis of said first image.

27. (previously presented) The method of claim 1, wherein said second image is obtained using ultrasonic imaging.

28. (previously presented) The method of claim 1, wherein both of said historical and rescanned ROIs are three-dimensional volume regions which are aligned by registration in three dimensions.